



# International Space Station Electrical Power System Book

## ISS-Expedition 1

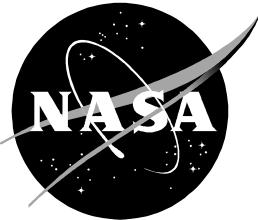
Mission Operations Directorate  
Operations Division

Preliminary  
March 11, 1998

These procedures are available  
electronically on the SODF Homepage  
at <http://ftp.proc.jsc.nasa.gov>

National Aeronautics and  
Space Administration

Lyndon B. Johnson Space Center  
Houston, Texas



**INTERNATIONAL SPACE STATION  
ELECTRICAL POWER SYSTEM BOOK  
ISS-EXPEDITION 1**

PRELIMINARY  
March 11, 1998

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This document is not currently under the configuration control of the Systems Operations Data File Control Board (SODFCB). During the interim, changes may be submitted to the book manager.

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The SODF procedures listed here are for the use of the Expedition 1 crew. By final publication, all applicable Increment 1 procedures will be included in this list. The current list of procedures is for use from 2R docking to 5A docking based on Rev C Assembly Sequence.

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NOMINAL PROCEDURES

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Z1 PCU CATHODE BAKE OUT.....	TBD
Z1 PCU SETPOINT CHANGE .....	TBD
Z1 PCU SWAP .....	TBD

**NOMINAL**

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## FGB ARCU ACTIVATION

- PCS      1. VERIFY ARCUS CONVERTER OFF  
FGB: EPS  
FGB EPS

sel ARCU Details  
√ARCU 1(2), 3(4) Converter Status - Off

**MCC-H ⇒ MCC-M**, "Go for ARCU Activation."

2. APPLY POWER TO SM ARCUS  
Z1: EPS: RPCM Z13B A  
RPCM Z13B A

sel    RPC 1  
**cmd** Close  
√Position - CI

Z1: EPS: RPCM Z14B A  
RPCM Z14B A

sel    RPC 1  
**cmd** Close  
√Position - CI

3. VERIFY INPUT VOLTAGE TO SM ARCUS  
FGB: EPS  
FGB EPS

sel ARCU Details  
√ARCU 1(2), 3(4) Input Voltage: 117 --- 126 V

**MCC-M ↑ shuttle**, "Go for ARCU Activation."

- Russian  
PCS      4. TURN ARCU CONVERTER ON  
sel    ARCU 1(2), 3(4)  
**cmd** FGB ARCU 1(2), 3(4) Converter - On  
√ARCU 1(2), 3(4) Converter Status - On

Shuttle ↓ **MCC-M ⇒ MCC-H**, "ARCU Activation complete."

## FGB ARCU DEACTIVATION

- PCS      1. TURN ARCU CONVERTER OFF  
FGB: EPS  
EPS

sel ARCU [X] [X]= 1 3  
**cmd** FGB ARCU[X] Converter - Off  
√ARCU[X] TBD V  
Repeat

2. REMOVE POWER FROM FGB RACUs  
Z1: EPS: RPCM Z13B A  
RPCM Z13B A

sel RPC 1  
**cmd** Open  
√Position - Op

Z1: EPS: RPCM Z14B A  
RPCM Z14B A

sel RPC 1  
**cmd** Open  
√Position - Op

3. VERIFY INPUT VOLTAGE TO FGB ARCUS  
FGB: EPS  
EPS

sel ARCU Details  
√ARCU 1, 3 Input Voltage: 0.0 V

## P6 POWER TRANSFER TO RUSSIAN SEGMENT

### NOTE

Steps 2 through 6 should be performed during a Russian ground communication pass.

- PCS 1. VERIFY USOS IS READY FOR P6 POWER TRANSFER

P6: EPS

**P6:EPS**

✓DDCU 2B Output Pwr + Channel 2B Output Power > TBD kW  
✓DDCU 4B Output Pwr + Channel 4B Output Power > TBD kW

sel [X] [X] = **2B** **4B**

P6: EPS: DCSU [X]

**DCSU [X]**

✓Vbus: 143 --- 165 V

✓RBI 6 Current < 79.8 A

sel DDCU-[X]

✓Output Voltage: 122 --- 126 V

sel RPCM [X] B

✓Input Current < 4 A

sel BCDU-[X]1

✓Batt SOC > 0.80

sel BCDU-[X]2

✓Batt SOC > 0.80

Repeat

Z1: EPS: RPCM Z14B A

**RPCM Z14B A**

✓RPC 1 Position - Op

Z1: EPS: RPCM Z13B A

**RPCM Z13B A**

✓RPC 1 Position - Op

2. VERIFY FGB IS READY FOR P6 POWER TRANSFER

FGB: EPS

**FGB:EPS**

'ARCU Details'

✓ARCU [X] Converter Status - Off [X] = 

1	2	3	4
---	---	---	---

**MCC-M** ⇒ **MCC-H** ↑ shuttle, "Go for ARCU Power Feed."

3. CONFIGURE USOS TO TRANSFER POWER TO FGB

NOTE

ARCU 1 is powered by RPCM Z14B A.

ARCU 3 is powered by RPCM Z13B A.

Z1: EPS: RPCM Z14B A

**RPCM Z14B A**

sel RPC 1

**cmd Close**

✓Position - CI

Z1: EPS: RPCM Z13B A

**RPCM Z13B A**

sel RPC 1

**cmd Close**

✓Position - CI

**MCC-H** ⇒ **MCC-M**, "Go for ARCU Activation."

4. VERIFY HEALTH AND STATUS OF FGB ARCUs 1, 2, 3, AND 4

FGB: EPS

**FGB:EPS**

sel ARCU Details

sel ARCU [X] [X] = 

1	2	3	4
---	---	---	---

✓ARCU[X] Input Voltage: 117 --- 126 V

✓Input Current: 0.2 A

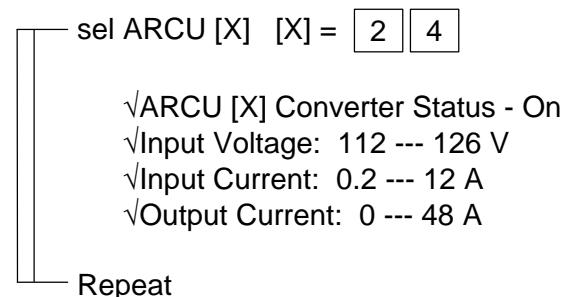
✓Output Current: 0 A

Repeat

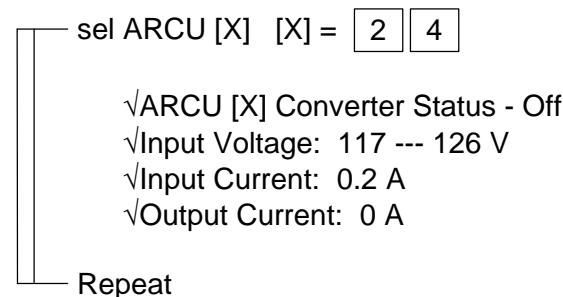
Russian  
PCS

5. CHECKOUT ARCUs 2 AND 4

**cmd** FGB ARCU 2 Converter On  
**cmd** FGB ARCU 4 Converter On

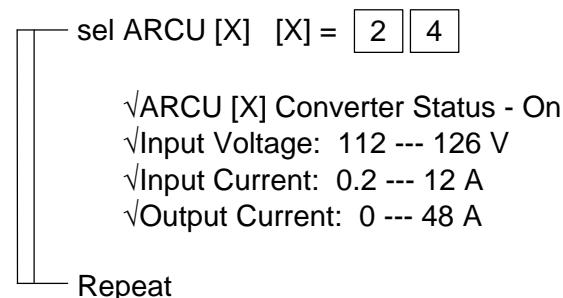


**cmd** FGB ARCU 2 Converter Off  
**cmd** FGB ARCU 4 Converter Off



6. ACTIVATE ARCUs 1 AND 3

**cmd** FGB ARCU 2 Converter On  
**cmd** FGB ARCU 4 Converter On



**MCC-M** ⇒ **MCC-H** ↑ shuttle, "ARCU Activation complete."

## P6 PV RADIATOR DEPLOY

1. **PERFORM PV DATA LOAD**  
Uplink PV Diagnostic Dump Buffer List PPL (ver ID TBD)  
√PPL Load ID (TBD)
2. **VERIFY PV RADIATOR**  
PCS      P6: TCS: PVTCS 4B(2B)  
        **PVTCS 4B**  
  
sel P6 PVR  
√Config Recovery - Ena
3. **POWER-ON PVR DEPLOY/RETRACT MOTOR**  
**cmd** PVR Power On Arm  
**cmd** PVR Power On
4. **VERIFY PV RADIATOR PARAMETERS**

**CAUTION**  
PVTCS loop pressures must be ≤ 2068 kPa  
to prevent damaging the radiator during deployment.

  
√Outlet Pressure ≤ 2068 kPa  
√Deployed - Not Deployed  
√Retracted - Retracted  
√Ovcurr Trip - Not Tripped
5. **VISUALLY CONFIRM RADIATOR IS READY FOR DEPLOYMENT**  
Crewmember must confirm visually (via direct viewing or camera) the radiator is ready for deployment and that all launch restraints have been removed.

**WARNING**  
If deployment takes place during an EVA, ensure no EVA activities are being held within the deploy envelope of the radiator to avoid potential injury to EVA crewmember.

6. **CONFIG STATION TO FREE DRIFT**  
Perform ORB/ISS TO FREE DRIFT, all (SODF: MCS), then:
7. **DEPLOY PV RADIATOR**

**NOTE**  
Radiator deployment may take up to 10 minutes.

  
**cmd** PVR Deploy Arm  
**cmd** Deploy

PARAMETER	STOWED	TRANSITION	DEPLOYED
Cmd Stat	Stop	Deploy	Stop
Power Cmd	On	On	On
Deployed	Not Deployed	Not Deployed	Deployed
Retracted	Retracted	Not Retracted	Not Retracted
Overcurrent Trip	Not Tripped	Not Tripped	Not Tripped

8. POWER-OFF PVR DEPLOY/RETRACT MOTOR

**cmd** PVR Power Off Arm

**cmd** PVR Power Off

## SM ARCU ACTIVATION

- PCS
1. VERIFY SM ARCUS CONVERTER OFF  
FGB: EPS  
FGB EPS

sel ARCU Details  
√ARCU 1(2), 3(4) Converter Status - Off

2. APPLY POWER TO SM ARCUS  
Z1: EPS: RPCM Z13B A  
RPCM Z13B A

sel RPC 1  
**cmd** Close  
√Postion - CI

Z1: EPS: RPCM Z14B A  
RPCM Z14B A

sel RPC 1  
**cmd** Close  
√Postion - CI

3. VERIFY INPUT VOLTAGE TO SM ARCUS  
FGB: EPS  
FGB EPS

sel ARCU Details  
√ARCU 1(2), 3(4) Input Voltage: 117 --- 126 V

**MCC-H** ⇒ **MCC-M** ↑ shuttle, “Go for ARCU Activation.”

- Russian  
PCS
4. TURN ARCU CONVERTER ON  
sel ARCU 1(2), 3(4)  
**cmd** FGB ARCU 1(2), 3(4) Converter - On  
√ARCU 1(2), 3(4) Converter Status - On

Shuttle ↓ **MCC-M** ⇒ **MCC-H**, “ARCU Activation complete.”

## SM ARCU DEACTIVATION

- PCS      1. TURN ARCU CONVERTER OFF  
FGB: EPS  
EPS

sel ARCU [X] [X]= 2 4  
**cmd** FGB ARCU[X] Converter - Off  
√ARCU[X] TBD V  
Repeat

2. REMOVE POWER FROM FGB RACUs  
Z1: EPS: RPCM Z13B A  
RPCM Z13B A

sel RPC 1  
**cmd** Open  
√Position - Op

Z1: EPS: RPCM Z14B A  
RPCM Z14B A

sel RPC 1  
**cmd** Open  
√Position - Op

3. VERIFY INPUT VOLTAGE TO FGB ARCUs  
FGB: EPS  
EPS

sel ARCU Details  
√ARCU 2, 4 Input Voltage: 0.0 V

## Z1 DDCU ACTIVATION FROM P6 POWER

- PCS      1. VERIFY SOURCE POWER AND CLOSE RBI 6  
P6: EPS: DCSU 4B(2B)  
DCSU 4B(2B)

✓Vbus: 146 --- 165 V  
sel RBI 6  
**cmd** Close Arm  
**cmd** Close  
✓RBI 6 Position - Cl  
✓RBI 6 Voltage: 146 --- 165 V  
✓RBI 6 Current < 8 Amps

2. ENABLE DDCU Z14B(3B) REMOTE TERMINAL

sel DDCU Z14B(3B)  
sel Firmware  
**cmd** RT - Enable  
✓RT Enable - X  
**cmd** Cmd Clear  
✓Integ Counter - Incrementing

3. VERIFY DDCU Z14B(3B) INPUT AND OUTPUT POWER

✓Vin: 144 --- 166 V  
✓lin < 4 Amps  
✓Vout < 5 V  
✓Iout < 4 Amps

4. TURN DDCU Z14B(3B) CONVERTER ON

sel Converter  
**cmd** Conv On Arm  
**cmd** Conv On  
✓Vout > 121 --- 128 V  
✓Iout ~4 Amps  
✓Converter Temp < 87° C  
✓Pwr Supply Temp < 87° C  
✓Baseplate Temp < 87° C

\*\*\*\*\*  
\* If DDCU output voltage, current or temperatures go out of range, \*  
\* perform DDCU MALFUNCTION, all (SODF: EPS), then: \*  
\*\*\*\*\*

5. VERIFY RPCMS OPERATION

sel RPCM [X] [X] =  A  B  C

sel Firmware  
**cmd** RT - Enable  
√RT Enable - X  
**cmd** Cmd Clear  
√Integ Counter - Incrementing  
√RPCs (1 --- 18) Open  
√Input Current < 4 Amps  
√Input Voltage: 121 --- 128V  
√Baseplate Temp < 49° C

Repeat

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**MALFUNCTION**

**MALFUNCTION PROCEDURES**

P6 CH 2B LOSS .....	TBD
P6 CH 4B LOSS .....	TBD
P6 CH 4B(2B) BDCU/BATTERY POST CHANGEOUT ACTIVATION .....	TBD
P6 CH 4B(2B) RESTART - POST 4A CONFIGURATION.....	TBD
RPC TRIP OR POWER LOSS.....	TBD
RPCM LOSS OF COMM.....	TBD
Z1 SPDA RAIL HTR LOSS .....	TBD

**MALFUNCTION**

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CORRECTIVE PROCEDURES

SSR-1 BUS LOSS RPDA N1RS1 .....	TBD
SSR-1A BUS LOSS RPCM N1RS1 .....	TBD
SSR-1B BUS LOSS RPCM N1RS1 .....	TBD
SSR-1C BUS LOSS RPCM N1RS1 .....	TBD
SSR-2 BUS LOSS RPDA N1RS2 .....	TBD
SSR-2A BUS LOSS RPCM N1RS2 .....	TBD
SSR-2B BUS LOSS RPCM N1RS2 .....	TBD
SSR-2C BUS LOSS RPCM N1RS2 .....	TBD
SSR-3 BUS LOSS RPDA N13B .....	TBD
SSR-3A BUS LOSS RPCM N13B .....	TBD
SSR-3B BUS LOSS RPCM N13B .....	TBD
SSR-3C BUS LOSS RPCM N13B .....	TBD
SSR-4 BUS LOSS RPDA N14B .....	TBD
SSR-4A BUS LOSS RPCM N14B .....	TBD
SSR-4B BUS LOSS RPCM N14B .....	TBD
SSR-4C BUS LOSS RPCM N14B .....	TBD
SSR-5 BUS LOSS RPDA Z13B .....	TBD
SSR-5A BUS LOSS RPCM Z13B .....	TBD
SSR-5B BUS LOSS RPCM Z13B .....	TBD
SSR-6 BUS LOSS RPDA Z14B .....	TBD
SSR-6A BUS LOSS RPCM Z14B .....	TBD
SSR-6B BUS LOSS RPCM Z14B .....	TBD
SSR-7 BUS LOSS RPCM 2B_A POWER LOSS .....	TBD
SSR-8 BUS LOSS RPCM 4B_A POWER LOSS .....	TBD

**CORRECTIVE**

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REFERENCE DATA

LOAD SHED TABLES.....	TBD
POWER BUS CONNECTIVITY .....	TBD

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## CAUTION MESSAGES

EPS CAUTION MESSAGE TABLE..... 5-3

CAUTION  
MESSAGES

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## EPS CAUTION MESSAGE TABLE

Message Text	Condition	Action
Batt 4BXX(2BXX) Temp Out Of Range-P6	TBD	TBD
Batt 4BXX(2BXX) Trip-P6	TBD	TBD
Batt 4BXX(2BXX) Undervoltage Condition-P6	TBD	TBD
BCDU 4BX(2BX) 1553/FWC Errors-P6	TBD	TBD
BCDU 4BX(2BX) Battery Current Setpt Cmd Failed-P6	TBD	TBD
BCDU 4BX(2BX) Battery Current Setpt Cmd Invalid-P6	TBD	TBD
BCDU 4BX(2BX) Battery SOC Low Failure-P6	TBD	TBD
BCDU 4BX(2BX) Discharge Control Command Failed-P6	TBD	TBD
BCDU 4BX(2BX) Heater Control Command Failed-P6	TBD	TBD
BCDU 4BX(2BX) Loss of Comm-P6	TBD	TBD
BCDU 4BX(2BX) Loss of Comm Time Limit Expired-P6	TBD	TBD
BCDU 4BX(2BX) Observed vs Last Commanded State Discrepancy-P6	TBD	TBD
BCDU 4BX(2BX) Overtemp Condition-P6	TBD	TBD
BCDU 4BX(2BX) Trip-P6	TBD	TBD
BGA 4B(2B) 1553/FWC Errors-P6	TBD	TBD
BGA 4B(2B) Loss of Comm-P6	TBD	TBD
BGA 4B(2B) Observed vs Last Commanded State Discrepancy-P6	TBD	TBD
BGA 4B(2B) Pointing Control Command Failed-P6	TBD	TBD
BGA 4B(2B) Pointing Control Command Invalid-P6	TBD	TBD
BMRRM 4B(2B) Motor Current Limit Exceeded-P6	TBD	TBD
BMRRM 4B(2B) Motor Stall Condition-P6	TBD	TBD
BMRRM 4B(2B) Motor Velocity Limit Exceeded-P6	TBD	TBD
BMRRM 4B(2B) Trip-P6	TBD	TBD
DCSU 4B(2B) RBI 6 Overcurrent Condition-P6	TBD	TBD
DCSU 4B(2B) SCA Loss of Comm-P6	TBD	TBD
DCSU 4B(2B) SCA Observed vs Last Commanded State Discrepancy-P6	TBD	TBD
DDCU 4B(2B) Loss of Comm-P6	TBD	TBD
DDCU 4B(2B) Trip-P6	TBD	TBD
PV Local Bus Ancillary Data Error-P6	TBD	TBD
PVCU 4B SPD1553 Bus Controller Error-P6	TBD	TBD
PVTCS PFCS 4B(2B) 1553/FWC Errors-P6	TBD	TBD
PVTCS PFCS 4B(2B) Minimum Inlet Temp Safing Failed-P6	TBD	TBD

### **EPS CAUTION MESSAGE TABLE (Cont)**

Message Text	Condition	Action
PVTCS PFCS 4B(2B) Observed vs Last Commanded State Discrepancy-P6	TBD	TBD
PVTCS PFCS 4B(2B) Pump A/B Failure-P6	TBD	TBD
PVTCS PFCS 4B(2B) Warm Flow Control Valve Recalibration In Progress-P6	TBD	TBD
RPCM 4BA(2BA) Loss of Comm-P6	TBD	TBD
RPCM 4BA(2BA) Trip-P6	TBD	TBD
RPCM 4BB(2BB) Loss of Comm-P6	TBD	TBD
RPCM 4BB(2BB) Trip-P6	TBD	TBD
SSU 4B(2B) 1553/FWC Errors-P6	TBD	TBD
SSU 4B(2B) Coldstart Command Failed-P6	TBD	TBD
SSU 4B(2B) Loss of Comm-P6	TBD	TBD